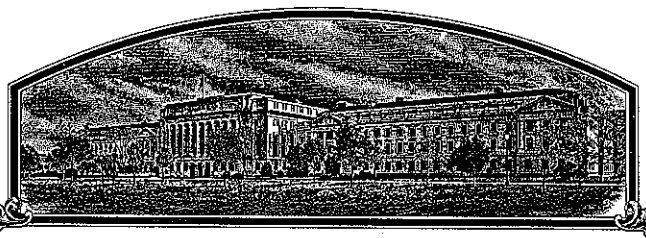

No. 9400014

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Texas Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF eighteen YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS [illegible] THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT

'Tam 300'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this 31st day of July in the year of our Lord one thousand nine hundred and ninety-five.

Attest:

Acting
Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

FORM APPROVED: OMB 0581-0055, Expires 1/31/91

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) *(as it is to appear on the Certificate)*
Texas Agricultural Experiment Station

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NO.
Tx86D1332

3. VARIETY NAME
TAM 300

4. ADDRESS *(street and no. or R.F.D. no., city, state, and ZIP)*
College Station, TX 77843

5. PHONE *(Include area code)*
409/845-4051

FOR OFFICIAL USE ONLY

PVPO NUMBER
9400014

FILING
Date: Oct. 21, 1993
Time: 8:10 [X] A.M. [ ] P.M.

FEES RECEIVED
Filing and Examination Fee: $ 2325.00
Date: Oct. 12, 1993
Certificate Fee: $ 275.00
Date: July 10, 1995

6. GENUS AND SPECIES NAME
Triticum aestivum L. Thell

7. FAMILY NAME *(Botanical)*
gramineae

8. CROP KIND NAME *(Common Name)*
wheat

9. DATE OF DETERMINATION
June 1987

10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION *(Corporation, partnership, association, etc.)*
official Public Agricultural Research Agency of the State of Texas

11. IF INCORPORATED, GIVE STATE OF INCORPORATION

12. DATE OF INCORPORATION

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS
Dr. Paul G. Sebesta
Texas Foundation Seed
Texas Agricultural Experiment Station
College Station, TX 77843-2581
PHONE *(Include area code)*: 409/845-4051

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED *(Follow INSTRUCTIONS on reverse)*
- a. [X] Exhibit A, Origin and Breeding History of the Variety.
- b. [X] Exhibit B, Novelty Statement.
- c. [X] Exhibit C, Objective Description of Variety.
- d. [ ] Exhibit D, Additional Description of Variety.
- e. [X] Exhibit E, Statement of the Basis of Applicant's Ownership.
- f. [X] Seed Sample (2,500 viable untreated seeds). Date Seed Sample mailed to Plant Variety Protection Office _____.
- g. [X] Filing and Examination Fee ($2,150) made payable to "Treasurer of the United States."

15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? *(See section 83(a) of the Plant Variety Protection Act.)*
[X] YES *(If "YES," answer items 16 and 17 below)* [ ] NO *(If "NO," skip to item 18 below)*

16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
[X] YES [ ] NO

17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?
[X] FOUNDATION [X] REGISTERED [X] CERTIFIED

18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?
[ ] YES *(If "YES," through* [ ] Plant Variety Protection Act [ ] Patent Act. Give date: _____.)
[X] NO

19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES?
[ ] YES (If "YES," give names of countries and dates)
[X] NO

20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT *(Owner(s))*	CAPACITY OR TITLE	DATE
Paul G. Sebesta	Director, Texas Foundation Seed	10-6-93
SIGNATURE OF APPLICANT *(Owner(s))*	CAPACITY OR TITLE	DATE

Exhibit A. Origin and Breeding History

'TAM 300', whose experimental designation was TX86D1332, has the pedigree 'TAM 106'/'Collin'. TAM 106 was released in 1979 by the Texas Agricultural Experiment Station (TAES) as an improved, hard red winter wheat cultivar and has the pedigree 'Sturdy' sib/'Tascosa'//'Centurk' (1). Collin was released as an improved hard red winter wheat cultivar in 1986 by TAES, and has the pedigree 'Agent'/Tascosa//Sturdy (2). The cross that produced TAM 300 was made in the greenhouse at TAES-Dallas in 1980. The progeny were grown as a bulk population in the field at Dallas from the 1982 through 1985 growing seasons. An F_5 plant from the cross was selected in the spring of 1985 at Dallas. The plant selection was designated TX86D1332. In 1989, 500 F_9 heads were selected from the line and the subsequent plants were screened for the presence of leaf rust (*Puccinia recondita* Roberge ex Desm.) resistance genes *Lr*1, *Lr*2a, *Lr*10, *Lr*16, and *Lr*24. Selected plants were grown in the field and evaluated visually for uniformity. In 1990, 289 of the visually uniform rows which possessed the specific *Lr* genes were bulked to form the breeder seeds of TAM 300. TAM 300 has been observed to be stable and uniform for agronomic traits in field trials from 1988 through 1993 at four locations in Texas (Dallas, Prosper, Chillicothe, and McGregor). The majority of plants in TAM 300 possess the resistance genes *Lr*1, *Lr*10, and *Lr*16. However, some plants in TAM 300 possess only the genes *Lr*2a and *Lr*24. In addition, some plants possess only *Lr*24. These latter two plant types each occur at a frequency of about one in 1,000, and are morphologically indistinguishable from the majority plant type.

1. Porter, K. B., E. C. Gilmore, and J. H. Gardenhire. 1980. Registration of TAM 106 wheat. Crop Sci. 20:114-115.

2. Marshall, D., J. H. Gardenhire, E. C. Gilmore, M. E. McDaniel, and C. A. Erickson. 1988. Registration of Collin wheat. Crop Sci. 28:868.

Exhibit B. Novelty Statement

'TAM 300' is the result of a planned cross between the cultivar 'TAM 106' and the cultivar 'Collin'. An F_5 plant was selected from the segregating progeny. TAM 300 is unique because of the genes it possesses for resistance to leaf rust (*Puccinia recondita* Roberge ex Desm.); and placed in a genetic background that is adapted to the southern plains of the United States. The most similar previously existing hard red winter wheat to TAM 300 is the cultivar TAM 106.

Tables 1 and 2 compare TAM 300 to its maternal parent TAM 106, and its pollen parent Collin, for days to heading stage and height. Over multiple locations and years, TAM 300 was similar to TAM 106 for these traits. Based on replicated experiments conducted under controlled conditions, TAM 300 was shown to carry the leaf rust resistance genes *Lr*1, *Lr*10, and *Lr*16 (Tables 3 and 4). As shown in Table 3, TAM 300 exhibited a susceptible seedling reaction only to isolates #8 and #15 (pathotypes MGB/SM and TKB/BL, respectively, in Table 4). By comparing the avirulence/virulence reactions of TAM 300 to TAM 106 (and Collin), it can be seen that the cultivars contain different genes for resistance to leaf rust. The gene held in common by the three cultivars is the gene *Lr*10. In addition, one of the F_9 head selections from the original F_5 plant selection was found to carry only the resistance genes *Lr*2a and *Lr*24. Another F_9 head selection from the original F_5 plant selection was found to carry only *Lr*24. These latter two plant types are morhologically, and otherwise indistinguishable from the majority plant type, and occur about one plant out of every 1,000 plants of TAM 300.

The expression of these gene combinations under field conditions is summarized in Table 5. It is clear from Table 5, that TAM 300 has a highly effective combinations of genes for resistance to leaf rust.

FORM APPROVED: OMB NO. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK AND SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (*TRITICUM SPP.*)

INSTRUCTIONS: *See Reverse.*

NAME OF APPLICANT(S)
Texas Agricultural Experiment Station

ADDRESS *(Street and No. or R.F.D. No., City, State, and ZIP Code)*
Texas Foundation Seed
Texas Agricultural Experiment Station
College Station, TX 77843-2581

FOR OFFICIAL USE ONLY

PVPO NUMBER
9400014

VARIETY NAME OR TEMPORARY DESIGNATION
Tx86D1332

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (e.g. [0][8][9] or [0][9]) when number is either 99 or less or 9 or less.

1. KIND:

[1] 1 = COMMON 2 = DURUM 3 = EMMER 4 = SPELT 5 = POLISH 6 = POULARD 7 = CLUB

2. TYPE:

[2] 1 = SPRING 2 = WINTER 3 = OTHER *(Specify)* _____ [2] 1 = SOFT 2 = HARD 3 = OTHER *(Specify)* _____

[2] 1 = WHITE 2 = RED 3 = OTHER *(Specify)* _____

3. SEASON - NUMBER OF DAYS FROM EMERGENCE TO:

[1][6][1] FIRST FLOWERING [1][6][6] LAST FLOWERING

4. MATURITY *(50% Flowering)*:

[1][1] NO. OF DAYS *EARLIER* THAN ..... [2] 1 = ARTHUR 2 = SCOUT 3 = CHRIS

[0][6] NO. OF DAYS *LATER* THAN ..... [7] 4 = LEMHI 5 = NUGAINES 6 = LEEDS 7=TAM107

5. PLANT HEIGHT *(From soil level to top of head)*:

[0][9][1] CM. HIGH

[1][3] CM. TALLER THAN ..... [7]

[3][0] CM. SHORTER THAN ..... [2] 1 = ARTHUR 2 = SCOUT 3 = CHRIS 4 = LEMHI 5 = NUGAINES 6 = LEEDS 7=TAM107

6. PLANT COLOR AT BOOTING *(See reverse)*:

[2] 1 = YELLOW GREEN 2 = GREEN 3 = BLUE GREEN

7. ANTHER COLOR:

[1] 1 = YELLOW 2 = PURPLE

8. STEM:

[1] Anthocyanin: 1 = ABSENT 2 = PRESENT

[1] Waxy bloom: 1 = ABSENT 2 = PRESENT

[2] Hairiness of last internode of rachis: 1 = ABSENT 2 = PRESENT

[1] Internodes: 1 = HOLLOW 2 = SOLID

[0][6] NO. OF NODES *(Originating from node above ground)*

[2][0] CM. INTERNODE LENGTH BETWEEN FLAG LEAF AND LEAF BELOW

9. AURICLES:

[1] Anthocyanin: 1 = ABSENT 2 = PRESENT

[1] Hairiness: 1 = ABSENT 2 = PRESENT

10. LEAF:

[1] Flag leaf at booting stage: 1 = ERECT 2 = RECURVED 3 = OTHER *(Specify)*: _____

[1] Flag leaf: 1 = NOT TWISTED 2 = TWISTED

[1] Hairs of first leaf sheath: 1 = ABSENT 2 = PRESENT

[1] Waxy bloom of flag leaf sheath: 1 = ABSENT 2 = PRESENT

[1][5] MM. LEAF WIDTH *(First leaf below flag leaf)*

[2][2] CM. LEAF LENGTH *(First leaf below flag leaf)*:

4

9400014

11. HEAD:

[2] Density: 1 = LAX 2 = DENSE

[1] Shape: 1 = TAPERING 2 = STRAP 3 = CLAVATE 4 = OTHER *(Specify)* _____

[4] Awnedness: 1 = AWNLESS 2 = APICALLY AWNLETED 3 = AWNLETED 4 = AWNED

[5] Color at maturity: 1 = WHITE 2 = YELLOW 3 = PINK 4 = RED 5 = BROWN 6 = BLACK 7 = OTHER *(Specify)*: _____

[1][0] CM. LENGTH

[1][0] MM. WIDTH

12. GLUMES AT MATURITY:

[3] Length: 1 = SHORT *(CA. 7 mm.)* 2 = MEDIUM *(CA. 8 mm.)* 3 = LONG *(CA. 9 mm.)*

[2] Width: 1 = NARROW *(CA. 3 mm.)* 2 = MEDIUM *(CA. 3.5 mm.)* 3 = WIDE *(CA. 4 mm.)*

[1] Shoulder shape: 1 = WANTING 2 = OBLIQUE 3 = ROUNDED 4 = SQUARE 5 = ELEVATED 6 = APICULATE

[3] Beak: 1 = OBTUSE 2 = ACUTE 3 = ACUMINATE

13. COLEOPTILE COLOR:

[1] 1 = WHITE 2 = RED 3 = PURPLE

14. SEEDLING ANTHOCYANIN:

[1] 1 = ABSENT 2 = PRESENT

15. JUVENILE PLANT GROWTH HABIT:

[2] 1 = PROSTRATE 2 = SEMI-ERECT 3 = ERECT

16. SEED:

[2] Shape: 1 = OVATE 2 = OVAL 3 = ELLIPTICAL

[1] Cheek: 1 = ROUNDED 2 = ANGULAR

[2] Brush: 1 = SHORT 2 = MEDIUM 3 = LONG

[1] Brush: 1 = NOT COLLARED 2 = COLLARED

[ ] Phenol reaction *(See instructions)*: 1 = IVORY 2 = FAWN 3 = LT. BROWN 4 = BROWN 5 = BLACK

[3] Color: 1 = WHITE 2 = AMBER 3 = RED 4 = PURPLE 5 = OTHER *(Specify)* _____

[0][6] MM. LENGTH

[0][3] MM. WIDTH

[3][4] GM. PER 1000 SEEDS

17. SEED CREASE:

[2] Width: 1 = 60% OR LESS OF KERNEL 'WINOKA' 2 = 80% OR LESS OF KERNEL 'CHRIS' 3 = NEARLY AS WIDE AS KERNEL 'LEMHI'

[2] Depth: 1 = 20% OR LESS OF KERNEL 'SCOUT' 2 = 35% OR LESS OF KERNEL 'CHRIS' 3 = 50% OR LESS OF KERNEL 'LEMHI'

18. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[R] STEM RUST *(Races)* HNLQ, QFBS, RTQQ, TNMH

[R] LEAF RUST *(Races)* TCBK, TDBP KFBP, SCDV

[0] STRIPE RUST *(Races)* _____

[0] LOOSE SMUT

[1] POWDERY MILDEW

[1] BUNT

[R] OTHER *(Specify)* Soil-borne Mosaic Virus

19. INSECT: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[ ] SAWFLY

[ ] APHID *(Bydv.)*

[ ] GREEN BUG

[ ] CEREAL LEAF BEETLE

[ ] OTHER *(Specify)* _____

HESSIAN FLY RACES: [ ] GP [ ] A [ ] B [ ] C [ ] D [ ] E [ ] F [ ] G

20. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant tillering	TAM 106	Seed size	Collin
Leaf size	TAM 106	Seed shape	Collin
Leaf color	TAM 106	Coleoptile elongation	TAM 106
Leaf carriage	TAM 106	Seedling pigmentation	TAM 106

INSTRUCTIONS

GENERAL: The following publications may be used as a reference aid for the standardization of terms and procedures for completing this form:

(a) L.W. Briggle and L. P. Reitz, 1963, Classification of Triticum Species and Wheat Varieties Grown in the United States, Technical Bulletin 1278, United States Department of Agriculture.

(b) W.E. Walls, 1965, A Standardized Phenol Method for Testing Wheat Seeds for Varietal Purity, contribution No. 28 to the handbook of seed testing prepared by the Association of Official Seed Analysts. *(See attachment.)*

LEAF COLOR: Nickerson's or any recognized color fan should be used to determine the leaf color of the described variety.

Table 1. Days to heading (from January 1) of TAM 300 and its parents, Collin and TAM 106, in replicated performance trials from 1991 to 1993 in the Blacklands, Rolling Plains, High Plains, and East Texas[a].

	Blacklands				Rolling Plains				High Plains				East		
Variety	1991	1992	1993	3-yr avg	1991	1992	1993	3-yr avg[a]	1991	1992	1993	3-yr avg	1991	1993	2-yr avg
TAM 300	100	104	109	104	102	105	119	109	119	116	126	120	97	106	102
Collin	94	93	102	96	98	100	115	104	118	115	125	119	85	98	92
TAM 106	100	105	109	105	102	106	119	109	120	116	126	121	98	105	102

[a] The data are means of four locations in the Blacklands, Rolling Plains, and High Plains in each year; and two locations in each year in East Texas.

Table 2. Height (inches) of TAM 300 and its parents, Collin and TAM 106, in replicated performance tests from 1991 to 1993 in the Blacklands, Rolling Plains, and East Texas[a].

	Blacklands				Rolling Plains				East		
Variety	1991	1992	1993	3-yr avg	1991	1992	1993	2 or 3-yr avg[a]	1991	1993	2-yr avg
TAM 300	32	36	38	35	26	39	30	32	27	32	30
Collin	28	32	35	32	25	34	27	29	22	24	23
TAM 106	32	38	38	36	26	43	31	33	30	32	31

[a] The data are means of four locations in the Blacklands and Rolling Plains; and two locations in each year in East Texas.

Table 3. Seedling infection types[a] on TAM 300, its parents Collin and TAM 106, and 22 Thatcher (TC) near-isogenic lines inoculated with 16 isolates of *Puccinia recondita*.

Genotype	Isolate number															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TAM 300	0;	;1C	1+	0;	0;1	;1	;1C	3+	2-	12	0;	0;	0;	;1C	3+	0;
Collin	0;	;1C	1	0;	3+	;1	4	;1C	1+	12	0;	;1	0;	3+	3+	0;
TAM 106	0;	1C	1+	3	3+	;1	1C	;1C	2-	12	0;	4	0;	3+	3+	0;
TCLr 1	0;	0;	0;	0;	0;	3+	4	3+	4	3+	3+	4	3+	3+	3+	3+
TCLr 2a	0;	;	0;	3	3+	;	0;	0;	0;	0;	3-	3+	3-	3	3	3
TCLr 2b	0;	3+	3+	3	3+	;	0;	0;	3+	0;	3-	3+	3-	3+	3	3
TCLr 2c	0;	;	0;	3	3+	;	0;	0;	3+	0;	3-	3+	3-	3+	3	3
TCLr 3	;	4	3+	3+	3+	4	4	3+	4	4	;1	;1	3+	4	3+	4
TCLr 3bg	;1	3+	3-	12	2	;1	3+	3-	3+	;1	2+	2	3-	12	2	;1
TCLr 3ka	12	21C	12	12	12	2	3C+	21C	3+	3C-	2	21C	23	21C	12	21C
TCLr 9	0;	0;	3-	0;	0;	0;	0;	0;	0;	3	0;	0;	0;	0;	0;	3+
TCLr 10	4	4	3+	4	3+	;1	4	3+	4	3+	;1	4	0;	4	3+	;1C
TCLr 11	2c	3C	23	1C	23	23	23	23	23	3	23	23	23	1C	23	3C+
TCLr 13	2X+	23C	3+	3X+	3X+	3-	3+	3-	2X+	2X+	23C	3X+	3X-	3X+	2+	2+
TCLr 14a	2+	4X	4	3+	4X	3+	4X	3+	3X+	3+	23	4	3X+	3X+	3+	4
TCLr 15	;	4	1	4	1	4	4	3+	4	1	;	4	3+	1	1	;
TCLr 16	;1N	1CN	1CN	2CN	2CN	1CN	1CN	3CN	1CN	1CN	2CN	1CN	2CN	1CN	3N+	2CN
TCLr 17	2C	12C	12C	;1C	12C	3C+	;1C	12C	12C	12C	3C-	;1C	;1C	;1C	12C	2C
TCLr 18	2C	3C	;1C	;1C	12C	;1C	;1C	;1C	3C	12C	2C	3C+	3C	;1C	12C	3C+
TCLr 23	3+	3+	23C	23C	23C	3C+	3C+	;1	3C+	2+	2+	3+	3C	2+	23C	;1
TCLr 24	0;	0;	0;	;1	3+	0;	3+	0;	0;	0;	0;	3+	0;	3+	3+	;1
TCLr 26	;1	;1-	0;	;1	3-	3-	3+	0;	;1-	;1	3+	3+	3	;1-	3	3
TCLr 27+31	23	3X	23-	3X-	23-	2X+	23	3+	3X+	23-	23	3+	3X	2X+	2X+	2X+
TCLr 28	3+	3+	0;	3-	3-	3-	3+	3+	3+	3-	;1	3+	3	0;	3	3
TCLr 34	3+	X3-	3+	3+	3+	3+	X3-	3+	X3-	X3-	3+	X3-	3+	3+	3+	3+

[a] Infection types are coded as follows: "0" = No uredinia or other macroscopic signs of infection; ";" = no uredinia, but hypersensitive necrotic or chlorotic flecks of varying size present; "1" = small uredinia often surrounded by necrosis; "2" = small-to-medium uredinia sometimes surrounded by chlorosis or necrosis; "3" = medium-sized uredinia that may be associated with chlorosis or rarely necrosis; "4" = large-sized uredinia usually without chlorosis or necrosis; "X" = random distribution of variable sized uredinia. The seven infection types may be modified as follows: "+" = uredinia somewhat larger than normal for the infection type; "-" = uredinia somewhat smaller than normal for the infection type; "C" = more chlorosis than normal for infection type; and "N" = more necrosis than normal for infection type. More than one infection type for a given genotype:isolate combination means that a range was observed, with the most predominant infection type listed first. Infection types "0", ";", "1", and "2" represent resistant reactions and types "3" and "4" represent susceptible reactions.

Table 4. Avirulence and virulence reactions on *Lr* genes[a] for the 16 pathotypes[b] of *Puccinia recondita* used to determine the presence or absence of *Lr* genes in TAM 300, and its parents Collin and TAM 106.

Isolate number	Pathotype	*Lr* gene avirulence	*Lr* gene virulence
1	BBB/BN	1,2a,2b,2c,3,3ka,3bg,9,11,13,14a,15,16,17,18,24,26,27+31	10,23,28
2	FBR/PP	1,2a,2c,3ka,9,13,16,17,24,26	2b,3,3bg,10,11,14a,15,18,23,27+31,28
3	FLM/QL	1,2a,2c,3ka,11,15,16,17,18,23,24,26,27+31,28	2b,3,3bg,9,10,13,14a
4	KBB/JM	1,3bg,3ka,9,11,16,17,18,23,24,26	2a,2b,2c,10,13,14a,15,27+31,28
5	KFB/GL	1,3bg,3ka,9,11,15,16,17,18,23,27+31	2a,2b,2c,3,10,13,14a,24,26,28
6	MCD/JD	2a,2b,2c,3bg,3ka,9,10,11,16,18,24,27+31	1,3,13,14a,15,17,23,26,28
7	MFL/SP	2a,2b,2c,9,11,16,17,18,27+31	1,3,3bg,3ka,10,13,14a,15,23,24,26,28
8	MGB/SM	2a,2b,2c,3ka,9,11,17,18,23,24,26	1,3,3bg,10,13,14a,15,16,27+31,28
9	PBM/PP	2a,9,11,13,16,17,24,26	1,2b,2c,3,3bg,3ka,10,14a,15,18,23,27+31,28
10	PLR/BL	2a,2b,2c,3bg,13,15,16,17,18,23,24,26,27+31	1,3,3ka,9,10,11,14a,28
11	SCF/BB	3,3bg,3ka,9,10,11,13,14a,15,16,18,23,24,27+31,28	1,2a,2b,2c,17,26
12	SFB/JP	3,3bg,3ka,9,11,16,17	1,2a,2b,2c,10,13,14a,15,18,23,24,26,27+31,28
13	TCB/KC	3ka,9,10,11,16,17,24	1,2a,2b,2c,3,3bg,13,14a,15,18,23,26,27+31,28
14	TDB/GL	3bg,3ka,9,11,15,16,17,18,23,26,27+31,28	1,2a,2b,2c,3,10,13,14a,24
15	TKB/BL	3bg,3ka,9,11,13,15,17,18,23,27+31	1,2a,2b,2c,3,10,14a,16,24,26,28
16	TMG/CB	3bg,3ka,10,13,15,16,17,23,24,27+31	1,2a,2b,2c,3,9,11,14a,18,26,28

[a] Avirulence and virulence reactions are based on seedling response. All pathotypes were avirulent for the genes *Lr*19, *Lr*21, *Lr*25, *Lr*30, *Lr*32, and *Lr*33. All pathotypes were virulent for *Lr*12, *Lr*14b, *Lr*20, *Lr*22a, and *Lr*22b. On seedlings, the gene *Lr*34 typically results in a "X3-" type reaction when tested at 54^{0}F and a "3+" type reaction at 65^{0}F.

[b] Pathotype nomenclature follows the North American system as described by Long and Kolmer (*Phytopathology*, 1989) and amended by Singh (*Plant Disease*, 1991).

Long, D. L. and J. A. Kolmer. 1989. A North American system of nomenclature for *Puccinia recondita* f. sp. *tritici*. Phytopathology 79:525-529.

Singh, R. P. 1991. Pathogenicity variations of *Puccinia recondita* f. sp. *tritici* and *P. graminis* f. sp. *tritici* in wheat growing areas of Mexico during 1988 and 1989. Plant Disease 75:790-794.

Table 5. Field assessment of leaf rust severity (%) and infection type (IT)[a] of TAM 300, and its parents Collin and TAM 106, in replicated performance trials in the Texas Blacklands from 1989 to 1993.

Variety	1989		1990		1991		1992		1993	
	%	IT	%	IT	%	IT	%	IT	%	IT
TAM 300	1	R	0	F	10	R	1	R	5	R
Collin	10	MS	60	MS	100	S	100	S	95	MS-S
TAM 106	70	S	70	S	60	MS	80	S	90	S

[a] The numbers represent the percent of the flag leaf covered (severity), and the letters refer to the size of the pustules where S=susceptible (very large); MS=moderately susceptible (large); MR=moderately resistant (small); R=resistant (very small); and F=fleck reaction (no sporulating pustule). Both assessed at soft dough stage.

Milling and Baking Quality:

Grain samples of TX86D1332 were submitted to the Cereal Quality Laboratory at College Station for analysis of milling quality in 1989, 1990, and 1991. For milling characteristics in 1989, the wheat protein of TX86D1332 was 1% or greater than TAM W-101, TAM 107, TAM 200, and Collin (Table 11). The flour protein was 1.3% or greater than the same check varieties. The water absorption of TX86D1332 was higher than the checks, and the mixing time of TX86D1332 slightly longer than TAM W-101 and TAM 200, yet shorter than TAM 107. In 1990 and 1991, TX86D1332 showed a high % milling yield, and maintained its high protein and good mixing time, as compared to the check varieties (Table 11).

The baking results from 1989 and 1990 showed that TX86D1332 had very good baking characteristics (Table 11). TX86D1332 had high % water absorption, good mixing times, and high proof heights as compared to the check varieties. In both years, TX86D1332 had the highest loaf volume compared to TAM W-101, TAM 107, TAM 200, and Collin.

Grain also was composited from all locations in the southernGreat Plains which harvested the USDA-SRPN in 1990 and 1991. Milling and baking tests were conducted at the USDA, Hard Winter Wheat Quality Laboratory in Manhattan, KS. As compared to the check varieties (Scout 66, TAM 105, and TAM 107), TX86D1332 had the highest weight per bushel, as well as high grain and flour protein (Table 12). Near infrared procedures were used to evaluate kernel hardness. In 1990, TX86D1332 had a grain hardness score of 81, the same as TAM 107, and harder than the 71 score for Scout 66 and TAM 105. In 1991, the hardness score for TX86D1332 was 72, while TAM 107 scored a 69 and Scout 66 scored a 68 (Table 12). Out of the 38 experimental lines and check varieties in 1990, and 45 in 1991, TX86D1332 was second only to TX86D1310 (another TAES-Dallas experimental line, which scored an 85 in 1990 and a 75 in 1991) in NIR-determined kernel hardness. Baking data from 1990 and 1991 indicated that TX86D1332 had a high percentage water absorption, a good mixing time, satisfactory crumb grain, and a high loaf volume (Table 12).

Justification for Release:

In the Blacklands of Texas, leaf rust is a perennial constraint to wheat production. The vast majority of hard red winter wheat varieties produced in this area are susceptible to leaf rust. TX86D1332 has multiple genes for resistance to leaf rust which potentially, could allow the variety to remain relatively resistant to leaf rust for a longer period of time than varieties with

Table 1. Yield, test weight, heading date, and leaf rust data of TX86D1332 and check varieties in replicated performance tests at Dallas and Prosper, TX in 1987 and 1988[a].

	Yield (bu/a)		Test Wt (lb/bu)		Heading [b]		Leaf rust [c]	
Variety	1987	1988	1987	1988	1987	1988	1987	1988
TX86D1332	48.0	58.6	60	61	105	108	1MR	1MR
Collin	47.6	64.1	58	60	99	101	1MS	20MS
NK Pro812	47.2	54.3	57	58	100	104	50S	40S
TAM 200	54.7	59.1	59	61	104	107	1MS	30MS

[a] The 1987 data are from Dallas only. The 1988 data are averages from Dallas and Prosper.

[b] Heading is days from January 1.

[c] The number in the leaf rust data is the percent of the flag leaf covered, and the letters refer to the size of the pustules where S=susceptible (very large); MS=moderately susceptible (large); MR=moderately resistant (small); and R=resistant (very small). Both assessed at soft dough stage.

Table 2. Yield (bu/acre) and test weight (lb/bu) of TX86D1332 and check varieties grown at four Texas locations in replicated performance tests in 1989.

	Chillicothe		Dallas		McGregor		Prosper	
Variety	Yield	TW	Yield	TW	Yield	TW	Yield	TW
TX86D1332	23.0	59	33.6	58	39.9	--[a]	24.5	58
Chisholm	23.1	58	30.9	58	33.2	--	21.7	56
Collin	24.8	57	3.7	--	0.0	--	18.7	55
Mesa	24.7	59	21.3	56	29.4	--	18.8	57
Mit	23.3	57	4.1	--	0.0	--	2.7	--
Siouxland 89	22.5	57	25.8	56	23.7	--	27.4	58
TAM 107	28.9	55	33.3	56	30.8	--	23.6	51
TAM 200	23.8	60	9.8	57	0.0	--	15.4	53
TAM 201	24.1	58	9.1	53	9.4	--	13.8	52
TAM 202	20.9	58	12.3	54	23.9	--	14.0	54
Thunderbird	25.4	57	27.5	57	28.6	--	28.4	55
2158	22.7	55	12.8	56	18.5	--	14.3	54
2163	24.3	55	22.7	53	23.8	--	17.4	53
2180	23.6	54	32.8	58	45.4	--	17.1	54

[a] Data not available.

Table 7. Test weight (lb/bu) of TX86D1332 and check varieties grown in Texas in replicated performance tests from 1990 to 1992.

	Blacklands				Rolling Plains				High Plains			
Variety	1990	1991	1992	3 Yr Avg	1990	1991	1992	3 Yr avg	1990	1991	1992	3 Yr Avg
TX86D1332	60	61	60	60	61	62	61	61	63	62	62	62
Chisholm	58	60	59	59	60	61	60	60	62	61	61	61
Collin	57	59	58	58	61	59	59	60	61	59	60	60
Karl	...a	60	60	60	61	61	60	61	62	60	61	61
Mesa	57	58	59	58	61	62	61	61	64	62	62	63
Mit	58	58	57	58	60	--	60	60	--	--	--	--
NK 814	--	57	58	58	--	--	--	--	--	--	--	--
Siouxland 89	55	59	58	57	60	60	59	60	62	60	60	61
TAM 107	52	55	58	55	58	59	58	58	61	61	59	60
TAM 109	50	54	57	54	58	60	58	59	62	61	60	61
TAM 200	57	59	58	57	60	62	60	61	65	62	61	63
TAM 201	55	58	56	56	59	60	58	59	62	60	59	60
TAM 202	57	60	58	58	58	60	59	59	63	61	60	61
Thunderbird	56	59	59	58	60	61	60	60	64	61	61	62
Waco	60	60	59	60	61	61	60	61	--	61	60	61
2158	59	58	60	59	61	61	60	61	62	61	60	61
2163	57	55	57	56	--	57	57	57	60	58	57	58
2180	60	59	57	59	61	60	59	60	63	60	60	61

[a] Data not available.

Table 8. Leaf rust severity and reaction type of TX86D1332 and check varieties in replicated performance tests at Dallas and Prosper, TX from 1987 to 1992 [a].

	Year					
Variety	1987	1988	1989	1990	1991	1992
TX86D1332	1 MR[b]	1 MR	1 R	0 F	10 R	1 R
Chisholm	30 S	65 S	100 S	100 S	100 S	100 S
Collin	1 MS	20 MS	10 MS	60 MS	100 S	100 S
Karl	-------[c]	-------	-------	-------	60 S	70 S
Mesa	70 S	80 S	50 S	80 S	100 S	100 S
Mit	10 MS	10 MS	20 MS	65 S	70 S	70 MS
NK 812	50 S	40 S	40 MS	30 MS	10 MS	40 MR
NK 814	-------	-------	-------	-------	65 S	60 S
Siouxland 89	15 S	35 S	90 S	90 S	100 S	100 S
TAM 107	90 S	90 S	100 S	100 S	100 S	100 S
TAM 109	-------	-------	-------	90 S	90 S	100 S
TAM 200	1 MS	40 S	40 S	80 MS	100 S	100 S
TAM 201	50 MS	40 MS	40 MS	80 MS	90 S	100 S
TAM 202	-------	-------	25 S	50 MS	90 S	100 S
Thunderbird	10 MS	5 MS	70 S	70 S	60 MS	80 S
Waco	-------	-------	-------	40 MS	60 S	80 S
2158	-------	-------	50 MS	70 MS	90 S	60 S
2163	-------	-------	0 F	5 R	60 MS	80 S
2180	-------	0 F	40 MS	30 MS	80 S	90 S

[a] Data averaged over both locations.

[b] The numbers represent the percent of the flag leaf covered (severity), and the letters refer to the size of the pustules where

S=susceptible (very large); MS=moderately susceptible (large); MR=moderately resistant (small); R=resistant (very small);

and F=fleck reaction (no sporulating pustule). Both assessed at soft dough stage.

[c] Data not available.

Table 9. Soilborne mosaic, stem rust, powdery mildew and barley yellow dwarf reaction of TX86D1332 and check varieties in replicated performance tests at Dallas and Prosper, TX from 1990 to 1992.

	Soilborne Mosaic	Stem rust		Powdery Mildew			Barley yellow dwarf	
	0 - 9[a]	race rxn		0 - 9			0 - 9	
Variety	1992	QCC	TPM	1990	1991	1992	1990	1992
TX86D1332	1	R[b]	MR	6	2	5	5	3
Chisholm	6	S	S	8	5	4	5	2
Collin	7	MR	MR	8	5	4	5	1
Karl	6	MR	S	-[c]	1	3	-	6
Mesa	0	MR	MR	7	7	6	3	3
Mit	8	S	S	6	5	4	2	3
NK 812	0	S	S	7	5	6	7	6
NK 814	8	--	--	-	1	4	-	3
Siouxland 89	7	MR	MR	0	0	0	5	2
TAM 107	9	MR	MR	0	0	0	7	5
TAM 109	6	--	--	7	6	6	3	2
TAM 200	8	MR	MR	0	0	0	2	3
TAM 201	7	--	--	7	5	5	4	1
TAM 202	8	MR	MR	0	0	0	7	3
Thunderbird	2	MR	MR	7	5	5	3	4
Waco	3	--	--	6	4	3	4	2
2158	0	--	--	8	5	4	3	2
2163	5	R	MR	6	2	2	4	2
2180	5	MR	S	8	5	6	2	3

[a] All 0-9 scales represent 0-3 as resistant, 4-6 as intermediate, and 7-9 as susceptible.

[b] Stem rust reactions are R=resistant; MR=moderately resistant; MS=moderately susceptible; and S=susceptible. Data provided by Dr. J. D. Miller, USDA-ARS, North Dakota State University, Fargo, ND.

[c] Data not available.

Table 10. Days to heading (from January 1) of TX86D1332 and check varieties grown in replicated performance tests from 1990 to 1992.

	Blacklands				Rolling Plains				High Plains			
Variety	1990	1991	1992	3 Yr Avg	1990	1991	1992	3 Yr Avg	1990	1991	1992	3 Yr Avg
TX86D1332	109	100	104	104	115	102	105	107	134	119	116	123
Chisholm	98	96	99	98	109	98	100	102	132	117	113	121
Collin	96	94	93	94	110	98	100	103	132	118	115	122
Karl	----[a]	95	99	97	110	100	105	103	132	119	115	122
Mesa	104	96	99	100	110	100	100	103	131	115	112	119
Mit	92	94	94	93	107	----	93	100	----	----	----	----
NK814	----	95	97	96	----	----	----	----	----	----	----	----
Siouxland 89	112	100	102	105	113	101	105	106	136	122	119	126
TAM 107	100	98	100	99	109	99	100	103	131	115	113	120
TAM 109	116	105	110	110	120	110	112	114	136	117	116	123
TAM 200	102	99	100	100	111	102	103	106	133	119	114	122
TAM 201	93	93	94	93	107	93	97	102	131	116	113	120
TAM 202	107	98	101	102	111	101	100	104	132	115	113	120
Thunderbird	110	100	105	105	115	102	106	108	134	120	116	123
Waco	93	95	94	94	108	94	96	103	----	115	113	114
2158	103	98	100	100	111	100	101	104	132	120	116	123
2163	107	98	101	102	----	100	105	103	133	118	115	122
2180	99	94	98	97	108	95	101	101	130	113	111	118

[a] Data not available.

Table 11. Milling results for TX86D1332 and check varieties in 1989,1990, and 1991 and baking results from 1989 and 1990 from Texas-grown samples as determined in the Cereal Quality Laboratory, Texas A&M University, College Station, TX.

	TX86D1332			TAM 101			TAM 107			TAM 200		
Milling parameter	1989	1990	1991	1989	1990	1991	1989	1990	1991	1989	1990	1991
Milling Yield (%)	49.5	69.1	63.9	49.9	66.3	61.8	51.5	66.0	61.8	50.0	63.2	64.4
Wheat Protein (%)	16.3	12.4	----a	15.3	12.4	-----	14.6	11.4	-----	14.8	11.9	-----
Flour Protein (%)	14.7	11.7	13.7	13.4	11.3	12.5	13.0	10.5	12.9	12.6	10.0	11.8
Water Absorption (%)	64.7	61.7	63.7	63.4	61.3	62.5	63.0	60.5	62.9	62.6	60.0	61.8
Mixograph Mix Time (min:sec)	3:45	4:30	5:30	3:30	4:30	4:15	4:30	4:30	3:30	3:30	4:30	5:15

	TX86D1332		TAM W101		TAM 107		TAM 200	
Baking parameter	1989	1990	1989	1990	1989	1990	1989	1990
Water Absorption (%)	64.0	59.7	63.0	60.2	63.0	60.2	60.5	58.7
Mixing Time (min:sec)	3:30	3:45	3:15	4:00	3:30	3:30	3:00	4:45
Proof Height (cm)	8.3	7.4	7.9	7.3	7.7	7.2	7.8	7.4
Loaf Volume (cc)	985	890	955	845	925	865	970	845
Bread Height (cm)	11.7	10.8	11.3	10.6	11.2	11.0	11.5	10.6

a Data not available.

Table 12. Milling and baking results for TX86D1332 compared to Scout 66, TAM 105 and TAM 107 in 1990, and to Scout 66 and TAM 107 in 1991. Samples were composited from 15 locations across the southern Great Plains and tested at the US Grain Marketing Research Laboratory, Manhattan, KS.

1990

	Milling and Baking Parameters										
Variety	Wt/bu (lb)	Ash (%)	Wheat protein (%)	Hardness NIR[a]	Flour yield (%)	Flour protein (%)	Absorption (%)	Mix time (min)	Gluten index[b]	Crumb grain[c]	Loaf volume (cc)
TX86D1332	60.6	1.61	14.8	81	72.2	13.9	67.1	3:75	80	8	993
Scout 66	59.5	1.57	14.2	71	73.9	13.1	62.0	3:00	83	8	945
TAM 105	57.2	1.53	13.5	71	72.1	12.3	62.9	3:00	82	7	945
TAM 107	57.3	1.48	13.2	81	73.5	12.2	66.2	3:38	81	6	937

1991

	Milling and Baking Parameters										
Variety	Wt/bu (lb)	Ash (%)	Wheat protein (%)	Hardness NIR[a]	Flour yield (%)	Flour protein (%)	Absorption (%)	Mix time (min)	Gluten index[b]	Crumb grain[c]	Loaf volume (cc)
TX86D1332	60.5	1.59	14.6	72	74.4	13.5	67.0	4:25	96	7	990
Scout 66	59.9	1.53	13.7	68	75.9	12.6	64.1	3:38	94	8	955
TAM 107	58.1	1.48	12.7	69	74.0	11.9	65.5	4:13	92	7	955

[a] Wheat hardness scores determined by near infrared reflectance (NIR) of sample; the higher the value, the harder the sample.

[b] Gluten index is the percentage of wet gluten remaining on an 80 micron metallic sieve (Glutomatic procedure).

[c] Crumb grain was rated with numbers: 8 for satisfactory; 7 for questionable-to-satisfactory; 6 for questionable; 5 for questionable-to-unsatisfactory; and 4 for unsatisfactory.

Exhibit E. Statement of the Basis of Applicant's Ownership

Ownership of TAM 300 by the Texas Agricultural Experiment Station (TAES) is based on the fact that unique TAES wheat breeding lines were made at TAES facilities at Dallas, Texas. TAES personnel performed all selection and testing activities. Initial Breeder Seed was made by TAES.